ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Fife Symington, Governor Russell F. Rhoades, Director

MU96:0294 **Inv. No. #101704**

November 5, 1996

John T. Kline
Environmental Project Manager
Magma Copper Co. - Florence Project
14605 East Hunt Highway
Florence, AZ 85232

RE: Hydrologic Review of the Florence Project Aquifer Protection Program (APP) permit application

Dear Mr. Kline:

The APP Mining Unit of the Arizona Department of Environmental Quality (Department) is in the process of completing a technical review of the APP application for the Florence Project as required by Arizona Administrative Code (A.A.C.) R18-9-107.F. This APP application, dated January 22, 1996, was determined to be complete by ADEQ on February 20, 1996. The first technical review letter was sent out on May 1, 1996, and covered Volume IV (Modeling) and Volume V (Detailed Engineering Design) of the Florence APP application.

This technical review letter provides Gary Burchard's comments as a result of his review of the following documents:

- Magma Florence In-Situ Project Aquifer Protection Permit Application, Volumes I, II, III, and V. Application dated January 1996.

- BHP Copper's Response to Comments from the U.S. Environmental Protection Agency [EPA], dated May 7 and June 27, 1996, regarding the Florence Project Aquifer Protection Permit Application. Response dated September 4, 1996.

- BHP Copper's Response to Comments from the Arizona Department of Environmental Quality [the Department], dated May 1, 1996, regarding the Florence Project Aquifer Protection Permit Application. Response dated September 4, 1996.

This letter does not provide a review of BHP Copper Co.'s September 28, 1996, response to ADEQ's comments on Volume V (Detailed Engineering Review). This

review, along with additional hydrologic review comments, will be provided in a subsequent letter.

The following comments are identified below by volume and section numbers. Quoted portions of the application, are presented in italics.

I. GENERAL COMMENT

As stated in Mr. Burchard's first review, the overall purpose of the hydrologic review is to evaluate the demonstration required by the Arizona Revised Statutes (A.R.S.) §49-243.B.2 and B.3 that the discharge from a facility will not cause or contribute to a violation of aquifer water quality standards (AWQS) at the applicable point of compliance (POC). For the *in-situ* portion of this mining project, both the demonstrations of compliance with aquifer water quality standards and BADCT (A.R.S. §49-243.B.1) depend upon the maintenance of hydraulic control of the mining solutions. For the *in-situ* portion of this mining project, these two demonstrations are intertwined if not the same.

The hydrologic review also determines the following information required for an aquifer protection permit:

- Alert Levels (Arizona Administrative Code (A.A.C.) R18-9-110),
- Discharge Limitations (A.A.C. R18-9-111),
- Monitoring Requirements (A.A.C. R18-9-112),
- Reporting Requirements (A.A.C. R18-9-113),
- Contingency Plan Requirements (A.A.C. R18-9-114),
- Compliance Schedule (A.A.C. R18-9-115), and
- Temporary Cessation, Closure, and Post-Closure Plans (A.A.C. R18-9-116).

II. SPECIFIC COMMENTS REGARDING THE JANUARY 1996 APPLICATION

1. Volume II - Sections 3.8 and 4.5, regional and local groundwater quality.
Nitrate concentrations reportedly range from 0.4 to 140 mg/l.

   - BHP should confirm whether nitrate concentrations are reported as nitrogen or as nitrate.

2. Volume II - Sections 3.8 and 4.5, regional and local groundwater quality.
Figure 4.5-1 (II) presents "Sulfate Distribution in the Proposed In-Situ Mine Area; August 1995."

   - BHP should clarify why the concentration contours for the Lower Basin Fill Unit (LBFU) do not match the plotted sample concentrations.

3. Volume II - Sections 3.8 and 4.5, regional and local groundwater quality.
   Pages 4-24, 4-26, and Table 4.5-3 report the detection of benzoic acid, acetone and methyl ethyl keytone at concentrations of 530µg/l, 640µg/l, and 110µg/l, respectively.

   - The Department acknowledges that laboratory contamination may have caused some of the organic detection. However, the concentrations seem larger than one would expect from laboratory contamination. Benzoic acid, acetone and methyl ethyl keytone are common constituents in resins such as those used in roof bolts. Because BHP found these organic pollutants both up- and down-gradient of the underground workings present at the Florence site, their source is probably not residuals or waste left in the workings. Another possible source of the organic is the cement used in well construction. BHP should collect another round of organic samples from all the wells found to have detectable concentrations of the above three constituents to verify their source.

4. Volume II - Section 4.5 Groundwater Quality

   - BHP should provide the sampling and quality assurance procedures used to sample the air shaft.

5. Volume III - Appendix D4:
   BHP presented an analytical report for a sample labeled "B3." Two parameters were detected at concentrations greater that their respective AWQS:

Parameter	Concentration	AWQS
Nitrate	77 mg/l	45 mg/l
Gross α	4,500 ± 331 pCi/l	15 pCi/l

BHP also detected the following parameters at high concentrations:

Parameter	Concentration
Turbidity	22,000 NTU
Gross β	5,000 ± 106 pCi/l
Uranium-234	397.70 ± 88.81 pCi/l
Uranium-235	9.52 ±7.77 pCi/l
Uranium-238	415.90 ±92.44 pCi/l
Total Uranium	0.812 mg/l

- BHP has stated that B3 was a boring that unexpectedly came across perched water beneath the proposed evaporation pond site. A boring would explain the very high turbidity, and its location in an agricultural area would explain the high nitrate concentration. However, the Mining Unit does not understand the

source of the high radiochemical activities. Because BHP is proposing to locate a categorical discharging facility (A.R.S. §49-241.B.1) over this location, BHP should determine the source of these radiochemicals and demonstrate that any leakage through defects in the evaporation pond liner will not exacerbate the pre-existing problem or cause AWQS violations in the underlying aquifer.

6. Volume III - Appendices D2 and D2:
BHP presented the original analytical reports for radiochemical analyses. Many of the results have "*" or "**" printed after the result. Also many of the radon-222 and total uranium reports do not specify detection limits.

   - BHP should explain the meaning of the asterisks after the results. In all future reports, BHP should ensure that their selected laboratory reports detection limits.

   - Many of the gross α and gross β analyses presented in the January 1996, APP application show either negative activities or activities less than the reported error and, therefore, cannot be used for calculating alert levels. In addition, such reported activities cannot be used for compliance reporting. The minimum detectable activity or the detection limit should be reported with the analytical results.

7. Volume I - 5.2.1 Pollutant Management Area
Magma proposed a line circumscribing all surface facilities and the *in-situ* mining area as the pollutant management area (PMA) during the active life of the site. After closure, the PMA will comprise only the evaporation pond and the *in-situ* mining area. Figure 5.1-1 (I) shows the proposed PMA.

   - The proposed PMA will be adequate with the following change: the PMA should include only permitted facilities. Therefore, the closed facilities are not in the PMA and the eastern edge of the PMA should be a line extending northward from the eastern edge of the evaporation and tailings pond. Assuming clean closure of the SX/EW facility, after closure, the northern edge of the PMA will be the northern edges of the evaporation and tailings pond and the *in-situ* mining area (for the *in-situ* mining area, the PMA is the map view of the zone of hydrologic control, i.e., this zone shall be that depicted in Figure 5.1-1 (I).).

8. Volume I - Section 5.2.3, Proposed POC Monitoring Well System

"... If a release of a nonhazardous analyte is confirmed through the assessment of water chemistry from the primary well suite, then Magma proposes that [ADEQ] consider the subsequent selection of appropriate nonhazardous POC wells in downgradient locations

that will ensure the protection of future uses for the overlying aquifer. It is anticipated that these response POC wells would be located no further downgradient that the project property line, to a maximum distance of ½ mile from the boundary of the in-situ mine area."

- The Department agrees with BHP's proposal for the protection of future groundwater uses should a release occur. A permit for this facility should contain a contingency action that requires BHP to submit a determination, for approval by the Department, of whether a non-hazardous POC is warranted. BHP should remember, however, that A.R.S. §49-244.3 includes no limit on the distance a POC for non-hazardous substances may be from a permitted facility.

9. Volume V - Section 2.1.5, Well Development

   - BHP describe what the "mud breaker solution" is that "may be pumped into the perforations to promote clean-up."

10. Volume I - Section 7.1.1, Prevent Post-Operational Groundwater Quality Degradation From Spent Orebody

    Volume IV - Section 4.5.3, Geochemical Transport Parameters

    Volume IV - Section 4.5.4, Initial Conditions for Post-Closure

    BHP proposes a "close-as-you-go" method of closing the *in-situ* mined area. After copper concentrations in a mined block have dropped to below economic levels, BHP will "rinse" the mined block by a combination of clean-water injection with extraction and then extraction only. Concurrent with this rinsing, BHP will expand into the next mined block. Through numerical and geochemical simulations, BHP has determined that when sulfate concentrations have dropped to 750 mg/l, pollutants with numeric aquifer water quality standards (AWQS) will then have concentrations below their respective standard.

    If the closure performs as predicted, the *in-situ* PMA will contain no pollutants above their respective AWQS. This is important because the leaching process will have removed whatever attenuation capacity that may have existed within the mined blocks. If the PMA contains no pollutants above their respective AWQS, then the Department is assured that BHP will not exceed AWQS at the POC. Mr. Burchard states that groundwater monitoring will need to be in place for verification.

    - Table 3.5-2 of Volume IV presents a comparison of "Estimated Residual Solution Composition" and drinking water maximum contaminant levels (the

basis for AWQS). Some of the predictions were shown as " < " a certain concentration. Some of these concentrations were greater that their respective AWQS. BHP should confirm the predicted concentrations for the following pollutants:

Pollutant	AWQS (mg/l)
antimony	0.006
beryllium	0.004
cadmium	0.005
chromium	0.1
selenium	0.05

11. Volume V - Section 1.7.1.7, Closure [of Evaporation/Tailings Ponds]
BHP proposes:

...The ponds will be allowed to dry. The ... physical equipment will be removed ... The liner will be cut and rolled into the top of the pond. A soil cap will be placed on top of the ponds to limit infiltration, and the area will be revegetated. ...

Table 4.3-1 of Volume I presents estimated characteristics of both the evaporation pond solution and the tailings/evaporate salts.

- BHP did not specify the final disposition of the evaporites in the ponds. The Department does not expect BHP to know now whether they will remove the salts or dispose them in place. However, BHP should be aware of the requirements for either option.

- The evaporites most likely will exhibit toxic characteristics, and would, if not Bevill exempt, be considered a hazardous waste (under RCRA) as shown in the following:

Contaminant	Estimated Evaporation Pond Solution (mg/l)	Estimated Tailings/Evaporate Salts (mg/l)	Regulatory Level (mg/l)
arsenic	30.00	23.0	5.0
barium	1.0	0.05	100.0
cadmium	5	< 5	1.0
chromium	120	400	5.0
lead	< 1.0	< 10.0	5.0
mercury	< 0.01	< 0.1	0.2
selenium	< 0.1	< 0.1	1.0
silver	< 0.01	< 0.1	5.0

- BHP did not present an estimate of the radiochemical content of the evaporation pond upon closure. BHP should estimate these concentrations. Table 3.7-5 of Volume IV presents the "Chemical Composition in mg/L of the Experimental Column Leach Solutions." The two dominant ores presented the following radiochemical concentrations of leach solutions expected at the Florence site:

Analyte	Quartz Monzonite Leachate	Granodiorite Leachate
total uranium	4.362 mg/l	0.835 mg/l
uranium-234	1,745 ± 275 pCi/l	254 ± 43 pCi/l
uranium-235	59.8 ± 21.1 pCi/l	11.6 ± 5.6 pCi/l
uranium-238	1,611 ± 256 pCi/l	248 ± 42 pCi/l
gross α	8,649 ± 241 pCi/l	897 ± 56 pCi/l
gross β	3,683 ± 87 pCi/l	612 ± 29 pCi/l
radium-226	33.6 ± 2.1 pCi/l	19.5 ± 1.6 pCi/l
radium-228	< 2.0 pCi/l	< 2.0 pCi/l
radon-222	81.0 ± 14.4 pCi/l	24.3 ± 11.0 pCi/l

Nason, Shaw, and Aveson (1982, p. 378) report that both the quartz monzonite and granodiorite contain zircon as an accessory mineral. Mason and Berry[1] state, "Zircon is frequently radioactive due to the presence of Th and U replacing Zr in the structure; ... ." The concentration of radiochemicals is further corroborated by the findings reported in Appendix G of Volume II which states,

"The records search at Florence produced a Conoco interoffice communication indicating that a company named UOCO had approached Conoco about the possibility of leasing the Florence facilities to conduct small-scale uranium vat leaching operations. ... In addition, a 5-gallon container marked "uranium leach liquor" was found in the metallurgical laboratory during the facility inspection."

Regardless of the source of the radionuclides or the history of the site, before closure, BHP should submit to the Department a complete characterization of the evaporites and a detailed closure plan for the evaporation ponds. If BHP disposes of the evaporites in place, then the Department will have the information necessary to either close the facility under the APP program or to permit the closure as a solid waste disposal facility.

12. Volume V - Appendix E, Section 2.5, Abandonment Activities
    3. *A tremie pipe will be installed to approximately 20 feet below the bedrock contact, and a high-density acid resistant Type V cement will be placed from approximately 20 feet below the bedrock contact to approximately 20 feet above the bedrock contact. ...*

[1]Mason, Brian and L.G. Berry. 1959. Elements of Mineralogy. W.H. Freeman and Company. San Francisco. P. 505.

5. *Acid resistant Type V cement grout will be placed in the contact zone (from approximately 20 feet below the top of bedrock to approximately 20 feet above the top of bedrock.)*

- BHP should place the high-density acid-resistant Type V cement from 40 feet below the bedrock contact to 40 feet above to correspond to the "buffer" calculated and presented in BHP's September 4, 1996, response to the Department's comments.

13. Volume V - Appendix E, Section 2.5, Abandonment Activities

7. *Cement grout will be placed in the corehole or well from a depth of 50 feet to 2 feet bgs.*

- What water to cement ratio will BHP use for the plugging material?

14. Volume V - Appendix E, Section 2.5, Abandonment Activities

8. *... In areas of agricultural use, the surface grout seal will be extended to 25 feet and the surface casing will be cut 4 to 5 feet below the ground surface.*

- Because of increased incidental recharge, BHP should also grout the surface plug to a depth of 50 feet in agricultural areas

15. Volume I - Section 5.3.3, Determination of Compliance Levels and Verification of Compliance Level Exceedances

Tables 5.3-1 and 5.3-2 show which water quality variables would have alert levels (ALs) and which would have AQLs. In general, alert levels would be assigned to those variables that can serve as indicators for potential AQL exceedances, and AQLs would be assigned to variables that have AWQSs.

- Because the Department sees no need to invoke narrative AWQS (A.A.C. R18-9-405) at the Florence site, the Department will assign AQLs only to pollutants with numeric AWQS. The possibility of future adoption of additional numeric AWQS exists (refer to A.R.S. §49-223.G.), therefore, AQLs will be listed as "reserved" for pollutants that currently do not have numeric AWQS. ALs however, should be assigned to all analytes from the ambient groundwater study. Tables I and II indicate the monitoring analytes and frequencies.

16. Volume I - Section 5.3.4, Compliance Monitoring Locations

- Please refer to Part III, Specific Comments Regarding BHP's Response To EPA Comments. BHP has modified some of the proposed monitoring locations.

17. Volume I - Section 5.3.5, Water Quality Variables to be Measured

... Level 2 variables will [be] monitored annually regardless of the results of Level 1 monitoring. In addition, Level 2 variables will be monitored quarterly if alert levels are exceeded for Level 1.

- The Department encourages the use of indicator parameters (Level 1 variables) for compliance sampling. Consistent sampling of indicator parameters (Level 1) can reduce the need for frequent sampling of extended lists of parameters (Level 1 + Level 2). If sampling of indicator parameters is used, the Department suggests that the extended list of parameters (Level 2 + Level 1 variables) be sampled biennially. For contingency plan monitoring, Level 2 parameters may not need to be quarterly on a permanent basis. For example, a contingency plan could include monthly monitoring for Level 2 variables and then a return to quarterly Level 1 variables once the extent or degree of a problem is determined or corrected.

- The Department agrees with BHP's proposed analyte lists with the following changes (as shown in Tables I and II): silver may be deleted because it is not expected to be in the discharge and has no numeric AWQS; total recoverable petroleum hydrocarbons (TRPH) may be deleted because its analysis is redundant with THP; gross α and gross β activities should be added to the Level 1 variables; for quality control purposes, nitrate and the ion balance should be added.

18. Volume I - Appendix F, Section 2.0, Choosing Statistical Methods
ASTM has recently issued a provisional standard (PS 64-96) for "Developing Appropriate Statistical Approaches for Ground-Water Detection Monitoring Programs." BHP's proposal also closely matches the provisional ASTM standard.

- BHP should clarify what "k" factor will be used and how many future samples will be assumed to determine this "k."

19. Volume I - Appendix F, Section 3.2, Outliers

E. ... Magma proposes to remove all values from the baseline data that fall above the upper fence of a boxplot constructed from the data set.

and later

... Data points which fall outside the outer fence are called "far outside" values and are plotted individually with a different symbol ...

- The Department agrees with BHP's proposal for determining outliers. However, please clarify if above two sentences refer to the same data -- data that will be considered as outliers?

20. Volume I - Appendix F, Section 3.5, nonnormality

To address potential nonnormality, nonparametric approaches will be used when feasible.

- The Department would like to caution BHP that nonparametric approaches, especially nonparametric prediction intervals, can have a very large false-positive rate if the number of background samples is not sufficiently large.

21. Volume I - Appendix F, Section 3.6, seasonality

A. To minimize the effects of seasonality on verification resamples, sampling will be conducted during the first month of each quarter. If necessary, two resamples can then be collected during that quarter. ...

Footnote 3: To maintain independence, samples should generally not be collected any more frequently than monthly.

- The Department agrees with the need to allow resamples to reduce the probability that an exceedance occurs by chance alone. However, at this time, the Department will only allow one resample. Furthermore, the Department understands the importance of fulfilling the fundamental statistical assumption of independence, but BHP should explain the importance of maintaining independence between a sample and its verification.

22. Volume I - Appendix F, Section 3.7, censoring

F. Water quality data in reports to [ADEQ] and [EPA] management, and the public will be presented in a censored format.

- BHP may report the data as proposed above provided that the data are censored below the applicable AL or AQL.

III. SPECIFIC COMMENTS REGARDING BHP'S RESPONSE TO EPA COMMENTS - DATED SEPTEMBER 4, 1996.

1. Attachment 2 to Table 2
Table 1 of this attachment presents the "Recharge Input Values to the BHP Model. A note at the bottom of the table presents the method by which ADWR's values were converted from acre-feet over a four year period to feet/day for input to the MODFLOW recharge package.

- Apparently, the conversion incorrectly divided by 4 twice instead of once. Also, square miles were converted by using 5280 feet and not 2.7878×10^7 square feet.

2. Table 3: Response to EPA Technical Comments, June 27, 1996
BHP's response to Comment 13 of this table indicates that BHP is no longer intending to use temperature or noise logs for mechanical integrity testing (MIT).

   - BHP should present a demonstration of the precision and accuracy of using cementing records when attempting to discern the presence of a potentially small but critical preferential flow pathway parallel to the well casing.

   - In a related issue, does BHP intend to sand blast or in some other way "rough up" the well casings to improve the adherence of the annular seal?

3. Attachment 3 to Table 3

   - BHP has proposed a network of 31 wells to monitor the POC at the Florence site. In Table I, appended to this letter, Mr. Burchard has presented this network as he understands it. BHP has modified this proposed network several times throughout the permitting process, and the Department's table may need updating.

   - BHP's proposed network around the *in-situ* portion of the facility appears adequate to detect changes in groundwater quality at the POC. Mr. Burchard was initially concerned about the adequacy of the Upper-Basin Fill (UBF) wells to monitor potential changes caused by the surface facilities (PLS, Raffinate, and Evaporation Ponds). However, a very simple model constructed with the Monitoring Analysis Package (Version 1.1, Golder Associates Inc., September 1992) indicates that the network will monitor the surface facilities with an efficiency over 90%. The printed output from this exercise is at the end of this memorandum. The shaded portion of the graphical output (approximately 7% of the surface area) represents the area of the evaporation pond that could potentially have a leak that could be undetected. Given the degree of engineering controls proposed and the uncertainty inherent with most hydrogeologic investigations, this small degree of uncertainty seems acceptable.

   - The last paragraph of Attachment 3 to Table 3 states: "during the operation of the first mine block and in at least one additional block, monitoring of the oxide zone around the perimeter of the mine block will be performed..." It was the Department's original understanding that comparison of head measurements between observation and recovery wells was to be performed and reported for

all operating mine blocks. The Department requests that this comparison be performed for all operating mine blocks.

4. Attachment 5 to Table 3

   - Figure 1 of this attachment presents an example figure that would accompany a compliance report. The northern, eastern, southern, and western observation wells for an active mine block have been identified. BHP should also identify their correspondingly paired recovery wells.

   - Tables 1 and 2 of this attachment present examples of flow budgets and head comparisons respectively that would accompany a compliance report. For the standard quarterly compliance report, BHP does not need to submit these tables. The proposed graphical representations will suffice (Figure 2 of this attachment). However, these tables should accompany any reports that result from AL exceedances or other contingency actions.

   - The "In-situ Tank Farm" section of the "Operations Plan" proposes contingency actions for this facility. What actions will BHP undertake if there is a power failure to prevent the surface tanks from emptying into the injection and recovery wells?

   - The "Emergency Conditions" section of the "Emergency Response/Contingency Plan Requirement" proposes conditions that will start the contingency plan. Seventy-two consecutive hours with a loss of hydraulic control seems like too long to wait before starting a contingency plan.

IV. SPECIFIC COMMENTS REGARDING BHP'S RESPONSE TO THE DEPARTMENT'S COMMENTS - DATED SEPTEMBER 4, 1996.

1. Table 1
   - Mr. Burchard believes that BHP's response to comment 3.8.1 is incorrect. The EPA 600-series methods are wastewater methods. No official EPA Method 600 3.2.3 exists. This reference should be cited according to the authors as: "Section 3.8.1 of 'Sobek, A.A., Schuller, W.A., Freeman, J.R., and R.M. Smith. 1978. Field and Laboratory Methods Applicable to Overburdens and Minesoils. EPA-600/2-78-054.'"

2. Attachment 6 to Table 1
   In this attachment, BHP reported that in the SX process, the organics used are about 7% reagent and about 93% diluent. One of the manufacturers, Phillips Mining Chemicals, reports that one of their diluents, Orfom SX-7, contains BTEX,

napthalene, and octane. One of these six constituents, benzene, is listed under A.R.S. §49-243.I. and has a numeric AWQS of 0.5 µg/l.

A.R.S. §49-243.I. requires that a new facility must reduce the discharge of benzene to the maximum extent practicable regardless of cost. Mr. Burchard believes that with the proposed method of hydraulic control, BHP has done this for the *in-situ* portion of the operations.

A.R.S. §49-203.A.9 requires monitoring at the applicable POC for pollutants listed under A.R.S. §49-243.I. and that are expected to be in the discharge. BHP has proposed to monitor the raffinate for petroleum hydrocarbons with an adequate method. However, because A.R.S. §49-203.A.9 requires monitoring at the applicable POC, benzene should be added to the biennial or contingency (Level 2) analyte list.

If you have any questions regarding these technical review comments please call me at (602) 207-4622 or Gary Burchard at (602) 207-4458.

Sincerely,

Shirin Tolle

Shirin Tolle, Environmental Engineer
Mining Unit
Water Protection Approvals and Permits Section

c: Gregg Olson, US EPA
Gary Burchard, Hydrologist, WPAPS, Mining Unit
Dennis Turner, Manager, WPAPS, Mining Unit *

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Attachments:

TABLE I. MONITOR WELLS FOR GROUNDWATER MONITORING

Sampling Point Number	Identifier	ADWR Registration #	Latitude	Longitude
001	M2-GU	55-		
002	M3-GL	55-		
003	M4-O	55-		
004	M5-S	55-		
005	M1-GL	55-		
006	M6-GU	55-		
007	M7-GL	55-		
008	M8-O	55-		
009	M9-S	55-		
010	M14-GL	55-		
011	M15-GU	55-		
012	M16-GU	55-		
013	M17-GL	55-		
014	M18-GU	55-		
015	O19-GL	55-		
016	P19-1-O	55-		
017	O49-GL	55-		
018	P49-O	55-		
019	M19-LBF	55-		
020	M20-O	55-		
021	M21-UBF	55-		
022	M22-O	55-		
023	M23-UBF	55-		
024	M24-O	55-		
025	M25-UBF	55-		
026	M26-O	55-		
027	M27-LBF	55-		
028	M28-LBF	55-		
029	M29-UBF	55-		
030	M30-O	55-		
031	M31-LBF	55-		
032	M32-UBF	55-		
033	M33-UBF	55-		
		55-		

Explanation to Footnotes:

1 These sites are the hazardous and nonhazardous Points of Compliance pursuant to A.R.S. §49-244.2 and A.R.S. §49-244.3, respectively.

TABLE II.
LEVEL II GROUNDWATER MONITORING

Suite A -- Monitor Wells

Common Ions:

Parameter	AQL[1] (mg/l)	Alert Level[1]	Sampling Frequency	Reporting Frequency
pH (field)	Reserved	Reserved	Biennially or as may be required by Contingency Plan	Biennially or as may be required by Contingency Plan
Specific Conductance (field)	"	"	"	"
Temperature (field)	"	"	"	"
Bicarbonate	"	"	"	"
Calcium (D)	"	"	"	"
Carbonate	"	"	"	"
Chloride	"	"	"	"
Fluoride	"	"	"	"
Magnesium (D)	"	"	"	"
Nitrate as nitrogen	"	"	"	"
Nitrite as nitrogen	"	"	"	"
Nitrate + Nitrite	"	"	"	"
Potassium (D)	"	"	"	"
Sodium (D)	"	"	"	"
Sulfate	"	"	"	"
Total dissolved solids	"	"	"	"
Cation/Anion Balance (calculated according to SM 1030F (1992))	none	± 5%	"	"

Trace Elements:

Parameter	**AQL[1] (mg/l)**	**Alert Level[1]**	**Sampling Frequency**	**Reporting Frequency**
Aluminum (D)	Reserved	Reserved	Biennially or as may be required by Contingency Plan	Biennially or as may be required by Contingency Plan
Antimony (D)	"	"	"	"

Arsenic (D)	"	"	"	"
Barium (D)	"	"	"	"
Beryllium (D)	"	"	"	"
Cadmium (D)	"	"	"	"
Total Chromium (D)	"	"	"	"
Cobalt (D)	"	"	"	"
Copper (D)	"	"	"	"
Iron (D)	"	"	"	"
Lead (D)	"	"	"	"
Manganese (D)	"	"	"	"
Mercury (D)	"	"	"	"
Nickel (D)	"	"	"	"
Selenium (D)	"	"	"	"
Thallium (D)	"	"	"	"
Zinc (D)	"	"	"	"

Radiochemicals:

Parameter	AQL[1] (pCi/l)	Alert Level[1]	Sampling Frequency	Reporting Frequency
Gross Alpha (D)	Reserved	Reserved	Biennially or as may be required by Contingency Plan	Biennially or as may be required by Contingency Plan
Gross Beta (D)	"	"	"	"
Radium 226 + Radium 228 (D)	"	"	"	"
Radon 222	"	"	"	"
Uranium (mg/l) (D)	"	"	"	"

Organics:

Parameter	AQL[1] (mg/l)	Alert Level[1]	Sampling Frequency	Reporting Frequency
Benzene	Reserved	Reserved	Biennially or as may be required by Contingency Plan	Biennially or as may be required by Contingency Plan
Total petroleum hydrocarbons	Reserved	Reserved	As may be required by Contingency Plan	As may be required by Contingency Plan
Acenaphthylene	"	"	"	"
Anthracene	"	"	"	"
Benzene	"	"	"	"

Benzo (a) anthracene	"	"	"	"
Benzo (a) pyrene	"	"	"	"
Benzo (b) fluoranthene	"	"	"	"
Benzo (ghi) perylene	"	"	"	"
Benzo (k) fluoranthene	"	"	"	"
Bromobenzene	"	"	"	"
n-Butylbenzene	"	"	"	"
sec-Butylbenzene	"	"	"	"
tert-Butylbenzene	"	"	"	"
Chlorobenzene	"	"	"	"
2-Chlorotoluene	"	"	"	"
4-Chlorotoluene	"	"	"	"
Chrysene	"	"	"	"
Dibenzo (a,h) anthracene	"	"	"	"
1,2-Dichlorobenzene	"	"	"	"
1,3-Dichlorobenzene	"	"	"	"
1,4-Dichlorobenzene	"	"	"	"
Ethylbenzene	"	"	"	"
Fluoranthene	"	"	"	"
Fluorene	"	"	"	"
Hexachlorobenzene	"	"	"	"
Indeno (1,2,3-cd) pyrene	"	"	"	"
Isopropylbenzene	"	"	"	"
p-Isopropyltoluene	"	"	"	"
Naphthalene	"	"	"	"
Pentachlorophenol	"	"	"	"
Phenanthrene	"	"	"	"
Pyrene	"	"	"	"
Toluene	"	"	"	"
1,2,3-Trichlorobenzene	"	"	"	"
1,2,4-Trichlorobenzene	"	"	"	"

1,2,4-Trimethylbenzene	"	"	"	"
1,3,5-Trimethylbenzene	"	"	"	"
Total Xylene	"	"	"	"
n-Propylbenzene	"	"	"	"

TABLE III.
LEVEL I GROUNDWATER MONITORING

Monitor Wells:

Parameter	**AQL[1] (mg/l)**	**Alert Level[1]**	**Sampling Frequency**	**Reporting Frequency**
pH (field)	Reserved	Reserved	Quarterly	Quarterly
Specific conductance (field)	"	"	"	"
Temperature (field)	"	"	"	"
Fluoride	"	"	"	"
Magnesium (D)	"	"	"	"
Sulfate	"	"	"	"
Total dissolved solids	"	"	"	"
Gross Alpha (pCi/l) (D)	"	"	"	"
Gross Beta (pCi/l) (D)	"	"	"	"

Notes: (D) = field filtered